MA2019-10

MARINE ACCIDENT
INVESTIGATION REPORT

October 31, 2019

Japan Transport Safety Board

The objective of the investigation conducted by the Japan Transport Safety Board in accordance with the Act for Establishment of the Japan Transport Safety Board is to determine the causes of an accident and damage incidental to such an accident, thereby preventing future accidents and reducing damage. It is not the purpose of the investigation to apportion blame or liability.

Nobuo Takeda
Chairman
Japan Transport Safety Board

Note:

This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.

MARINE ACCIDENT INVESTIGATION REPORT

Vessel type and name: Cargo ship ERNA OLDENDORFF
IMO number: 9717670
Gross tonnage: 25,431 tons

Accident type: Collision (Bridge)
Date and time: Around 00:27, October 22, 2018 (local time, UTC +9 hours)
Location: Oshima Bridge which spans Obatake Seto, Yamaguchi Prefecture
Around 058°, 875m from the Oiso Lighthouse
(Approximately 33°57.5'N, 132°11.1'E)

October 2, 2019
Adopted by the Japan Transport Safety Board
Chairman Nobuo Takeda
Member Yuji Sato
Member Kenkichi Tamura
Member Yoshiko Kakishima
Member Makiko Okamoto

SYNOPSIS

<Summary of the Accident>

At around 00:27 on October 22, 2018, the cargo ship ERNA OLDENDORFF was proceeding east in Obatake Seto toward a privately-operated berth in Etajima City, Hiroshima Prefecture, with a master, a second officer and 19 other crewmembers aboard when she collided with Oshima Bridge.

ERNA OLDENDORFF received dents and other damage to three of her four cranes as well as a bent damage to her aft mast; however, there were no fatalities or injuries on the Vessel.

Oshima Bridge suffered cracks, dents, and other damage to its girders; an inspection passage that was installed under its girders was broken and fell, and a

water pipe was severed, causing a water outage that lasted for forty days affecting almost all of Suo-Oshima Town, Yamaguchi Prefecture; power cables, communication cables and others were severed as well.

<Probable Causes>

It is probable that the accident occurred when, while ERNA OLDENDORFF was proceeding east in Obatake Seto at night, she collided with Oshima Bridge because she proceeded under a bridge that she was unable to pass through at 'the heights above the water line at the time of the accident to the top of each cargo crane and the aft mast' (hereinafter referred to as "the height of crane and mast").

It is probable that ERNA OLDENDORFF proceeded under Oshima Bridge which she was unable to pass through at the height of her cranes and mast because the Master of ERNA OLDENDORFF approved the voyage plan, including the route from Onsan to Etajima by way of Obatake Seto, which was prepared by the Second Officer, without being aware of the height of Oshima Bridge, and the Master continued navigating while feeling uncertain about the bridge's height after getting close to the bridge.

It is probable that the Master approved the voyage plan, including the route from Onsan to Etajima by way of Obatake Seto, which was prepared by the Second Officer, without being aware of the height of Oshima Bridge because the Master did not check the details of the route assuming that the former master had already checked it.

It is probable that the Master continued navigating while feeling uncertain about the bridge's height after getting close to the bridge because he waited for a report from the Second Officer after the Master ordered the Second Officer to check the height of the bridge, and the Master was concerned that ERNA OLDENDORFF would be pushed toward shore by the westerly current in the situation that the navigable width became narrower after she turned to starboard off the west of Kasasa Shima.

It is somewhat likely that although the OLDENDORFF Carriers GmbH & Co.KG specified the procedures of voyage planning, etc. in the Safety Management Manual, etc., the Master and the Second Officer were insufficiently aware of the importance of complying with them, a situation that contributed to the occurrence of this accident.

<Safety Recommendation>

It is probable that ERNA OLDENDORFF proceeded under Oshima Bridge, which she was unable to pass through at the height of her cranes and mast, because the Master approved the voyage plan, including the route from Onsan to Etajima by way of Obatake Seto, which was prepared by the Second Officer, without being aware of the height of Oshima Bridge, and the Master continued navigating while feeling uncertain about the bridge's height after getting close to the bridge.

It is somewhat likely that although the OLDENDORFF Carriers GmbH & Co.KG specified the procedures of voyage planning, etc. in the Safety Management Manual, etc., the Master and the Second Officer of ERNA OLDENDORFF were insufficiently aware of the importance of complying with them, a situation that contributed to the occurrence of this accident.

Therefore, based on the result of the accident investigation, the Japan Transport Safety Board recommends to the OLDENDORFF Carriers GmbH & Co.KG and the authorities of Republic of Malta as follows.

(1) The OLDENDORFF Carriers GmbH & Co.KG is recommended to thoroughly conduct education and training for masters and other crewmembers to ensure voyage planning and implementing in compliance with the Safety Management Manuals revised after the accident.

(2) The authorities of the Republic of Malta are recommended to instruct the OLDENDORFF Carriers GmbH & Co.KG to ensure proper and continuous implementation of above (1).

1 PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident

At around 00:27 on October 22, 2018, the cargo ship ERNA OLDENDORFF was proceeding east in Obatake Seto toward a privately-operated berth in Etajima City, Hiroshima Prefecture, with a master, a second officer and 19 other crewmembers aboard when she collided with Oshima Bridge.

ERNA OLDENDORFF received dents and other damage to three of her four cranes as well as a bent damage to her aft mast; however, there were no fatalities or injuries on the Vessel.

Oshima Bridge suffered cracks, dents, and other damage to its girders; an inspection passage that was installed under its girders was broken and fell, and a water pipe was severed, causing a water outage that lasted for forty days affecting almost all of Suo-Oshima Town, Yamaguchi Prefecture; power cables, communication cables and others were severed as well.

1.2 Outline of the Accident Investigation

1.2.1 Setup of the Investigation

The Japan Transport Safety Board (JTSB) appointed an investigator-in-charge and two other investigators to investigate this accident on October 22, 2018, and one investigator at a later date.

1.2.2 Collection of Evidence

October 23 to 25, 2018: On-site investigations and interviews

November 2, 5, 9, 16, 25, 27, December 4, 11, 25, 27, 2018, January 22, February 5, 8, 12, 14, 15, 19, 21, 22, 28, April 23, 24, May 8, 23, June 13, 20, July 10, 12, 2019: Collection of questionnaire

March 15, 2019: Interviews and collection of questionnaire

1.2.3 Interim investigation report

On March 28, 2019, based on the factual information gained until then, JTSB submitted an interim report to the Minister of Land, Infrastructure, Transport and Tourism and made it public.

1.2.4 Comments from the Parties Relevant to the Cause

Comments on the draft report were invited from the parties relevant to the cause of the accident.

1.2.5 Comments from the Flag State

Comments on the draft report were invited from the flag State of the ERNA OLDENDORFF.

2 FACTUAL INFORMATION

2.1 Events Leading to the Accident

2.1.1 The Navigation Track according to the AIS data

According to the records of the Automatic Identification System*1 (AIS) data (hereinafter referred to as "the AIS records") received by a data company in Japan, the navigation tracks of the ERNA OLDENDORFF (hereinafter referred to as "the Vessel") from around 23:01 October 21 to 00:50 October 22, 2018 were as shown in Table 1 below.

It should be noted that the times are Japan Standard Time and the positions of the Vessel are the positions of the GPS antennas located on the upper side of the Vessel's bridge. The course over ground and heading are true bearings (hereinafter the same).

Table 1 AIS record of the Vessel (excerpt)

Time (HH:MM:SS)	Ship's position		Course over the Ground (°)	Heading (°)	Speed over the Ground*2 (Knots(kn))
	Latitude (N) (°- ′-″)	Longitude(E) (°- ′-″)			
23:01:14	33-45-32.9	132-04-46.6	053.4	053	12.7
23:15:14	33-47-18.5	132-07-37.4	053.0	052	12.8
23:30:33	33-49-29.1	132-09-58.7	009.6	010	11.7
23:45:05	33-52-21.3	132-09-56.0	351.1	350	12.5
00:00:03	33-55-05.0	132-09-19.4	346.7	345	10.1
00:05:35	33-55-54.4	132-08-55.8	327.9	329	9.9
00:10:15	33-56-32.8	132-08-46.0	017.9	025	8.5
00:15:25	33-57-06.0	132-09-16.7	051.1	050	8.3

*1 Automatic Identification System (AIS) is a device that each vessel uses to automatically transmit and receive information such as vessel identification code, ship type, name, position, course, speed, destination, and conditions of navigation, and to exchange information with other vessels or land-based navigation aids.

*2 "Speed over the ground" refers to the speed of a vessel as measured against one point on the earth's surface. The speed of a vessel as measured against the water in which the vessel is traveling is called "speed over water".

00:20:15	33-57-20.8	132-09-59.4	083.6	080	8.2
00:21:15	33-57-21.8	132-10-09.4	081.3	080	8.2
00:22:15	33-57-23.4	132-10-18.5	079.7	079	8.1
00:23:25	33-57-24.9	132-10-29.9	080.3	079	8.2
00:24:05	33-57-26.2	132-10-35.8	076.2	082	8.1
00:25:14	33-57-28.1	132-10-45.9	078.0	083	7.9
00:26:14	33-57-28.9	132-10-54.3	085.2	082	7.5
00:27:11	33-57-29.7	132-11-02.2	089.7	100	7.3
00:28:14	33-57-27.4	132-11-09.9	116.3	089	7.0
00:29:14	33-57-25.8	132-11-15.8	091.0	052	5.9
00:30:14	33-57-28.0	132-11-20.2	054.0	052	4.6
00:31:15	33-57-31.1	132-11-25.0	052.4	052	4.6
00:32:15	33-57-35.1	132-11-31.0	051.9	052	5.0
00:33:15	33-57-38.8	132-11-36.9	052.2	052	6.1
00:34:15	33-57-42.7	132-11-43.1	052.7	052	6.2
00:35:15	33-57-46.6	132-11-49.3	052.9	052	6.5
00:40:15	33-58-04.2	132-12-16.9	049.8	052	5.1
00:45:14	33-58-18.8	132-12-39.4	053.0	053	5.2
00:50:25	33-58-36.9	132-13-08.0	052.4	053	6.1

2.1.2 VDR Records of the Vessel

(1) Voices, etc. on the Vessel's Bridge

According to data recorded by the Vessel's Voyage Data Recorder (VDR) [*3], main voice communication, etc. recorded by microphones located inside of the Vessel's bridge and at it's both wings from around 23:54 October 21 to 00:41 October 22, 2018 was as shown in Table 2.

It should be noted that voices in Indonesian are translated into Japanese and shown in italics, and voices of maneuvering orders and their answerbacks are omitted from the table except those of immediately before and after the sound of impact.

Additionally, the sound of impact was recorded intermittently four times in

*3 "Voyage Data Recorder (VDR)" refers to a device that can record a ship's position, course, speed, radar information and other data related to navigation, as well as communications by VHF radio telephone and voice communication on the bridge, among others.

total, which started at around 00:27:05, 0:27:22, 00:27:32 and 00:27:43 respectively.

Table 2　Voice and Other Information (Excerpt)

Time (HH:MM:SS)	Main Voice Communication, etc.
23:54:52	Master (hereinafter referred to as "Master A"): Get up already second mate? Officer, second mate already call, ya?
23:59:15	Master A: Second, I forget. This is the bridge. I forget. This bridge very high? Check, ya? Second Officer (hereinafter referred to as "Navigation Officer A_1"): Bridge. Master A: …because passing…bridge. Navigation Officer A_1: Ah… Master A: …I don't know how… Navigation Officer A_1: …searching bridge, searching… Master A: …check up for that bridge. How many height this bridge, ya?
00:03:48	Master A: You get, second? Navigation Officer A_1: [Unclear voice]
00:04:40	Navigation Officer A_1: You just use sailing direction? I put on the table. Unknown : I saw…
00:14:35	Master A: Second, second, second. Come here, second. Navigation Officer A_1: …Oshima Bridge, Oshima Bridge. Master A: *Height…*
00:16:50	Master A: …green and red…white… Able Seaman (hereinafter referred to as "Able Seaman A"): Yes, sir.
00:20:30	Master A: *[Unclear voice]* Navigation Officer A_1: *[Unclear voice]*
00:26:10 00:26:12 00:26:25 00:26:37	Master A: *Going to hit. Going to hit.* Navigation Officer A_1: Hard starboard, hard starboard. Able Seaman A: Rudder, Hard starboard. Master A: Midship.

	Able Seaman A: Midship.
	Master A: OK, continue, continue. What's course?
	Able Seaman A: 091… now passing 095.
	Master A: Midship.
	Able Seaman A: Still already midship already, sir.
	Master A: Port 10.
	Able Seaman A: Rudder port 10.
00:27:05	[Sound of Impact (intermittently until around 00:27:55)]
	Navigation Officer A_1: Oh, shit. Oh, shit.
	Able Seaman A: Hitting the bridge. Now, 100, port 10.
00:27:23	Master A: Midship.
	Able Seaman A: Rudder Midship.
	Master A: Port 10.
	Able Seaman A: Rudder port 10.
00:27:42	Master A: Port 20.
00:27:48	Master A: Hard port.
	Able Seaman A: Rudder hard port.
00:28:10	Master A: Hard port, ya?
	Able Seaman A: Yes, sir. Rudder hard port.
00:28:38	Master A: Midship.
	Able Seaman A: Midship.
00:30:33	Master A: *I'll contact the agent first.*
00:34:36	Master A: *I'll call the agent. What's the name of the bridge?*
	Navigation Officer A_1: Oshima Bridge.
	Master A: Oshima Bridge, ya.
00:36:00	Master A: Hello, good morning. Sorry late night. Hello, Mr. Agent. Good morning. Hello, Captain ERNA OLDENDORFF. Hello, Mr. Agent. Yes, yes, Captain speaking. Yeah, good morning, Mr. Agent. I just…, because just I now touched the bridge, I touched the Oshima Bridge. Yes, so, can you confirm Coast Guard that I touched the Bridge now? I'm going to stop engine and drop anchor

	somewhere close to the east of Oshima Bridge. Yes, also, could you call Coast Guard because I touched the Bridge now, OK? OK, thank you. Thank you.
00:40:55	Navigation Officer A_1: *Drop Anchor?* Master A: *Just keep on, keep on.*

(2) Records of Main Engine Operation

According to the data recorded by the VDR, records of the operation of the main engine remote controller from around 23:50 October 21 to 00:58 October 22, 2018 were as follows.

Date and Time	Operation of the main engine remote controller
October 21 Around 23:49:59	Full ahead ⟶ Half ahead
↓	
October 22 [Around 00:27:05 to 00:27:55]	[Sound of Impact]
↓	
Around 00:32:09	Slow ahead
↓	
Around 00:35:11	Dead slow ahead
↓	
Around 00:37:15	Stop engine
↓	
Around 00:41:15	Dead slow ahead
↓	
Around 00:41:28	Slow ahead
↓	
Around 00:50:36	Half ahead
↓	
Around 00:58:06	Full ahead

(3) Image of the Electronic Chart Display and Information System (ECDIS) [*4]

In the Vessel's VDR, the state of the ECDIS screen installed on the Vessel was recorded as a still image every 15 seconds. From around 00:00 to 00:09 October 22, images in which the Vessel was navigating near Kasasa Shima, Suo-Oshima Town, Yamaguchi Prefecture were recorded and then at around 00:09:24 an image which was zoomed in the area near Oshima Bridge was recorded in the VDR.

According to the replies to the questionnaire by Navigation Officer A_1, he operated the ECDIS and zoomed Oshima Bridge on the screen at that time, but he did not carefully check the information displayed on the screen of the ECDIS because he panicked a little bit and focused on searching the information of the bridge's height using sailing directions issued by the United Kingdom Hydrographic Office (ADMIRALTY Sailing Directions Japan Pilot Volume 3, 11th Edition 2016; hereinafter referred to as "the Sailing Directions").

According to the replies to the questionnaire by Master A, he did not check the information displayed on the ECDIS himself because he focused on maneuvering of the Vessel to pass through a narrow channel and thought that the Vessel could pass under the bridge at that time.

(See Figure 1)

[*4] "Electronic Chart Display and Information System (ECDIS)" refers to a device that can display a ship's own position on an official electronic chart (Electronic Navigational Chart or Raster Navigational Chart) that meets the standards of the International Hydrographic Organization (IHO), as well as displaying radar, scheduled passages and other information in combination, and also has the function of transmitting alerts when approaching shallows and other hazards.

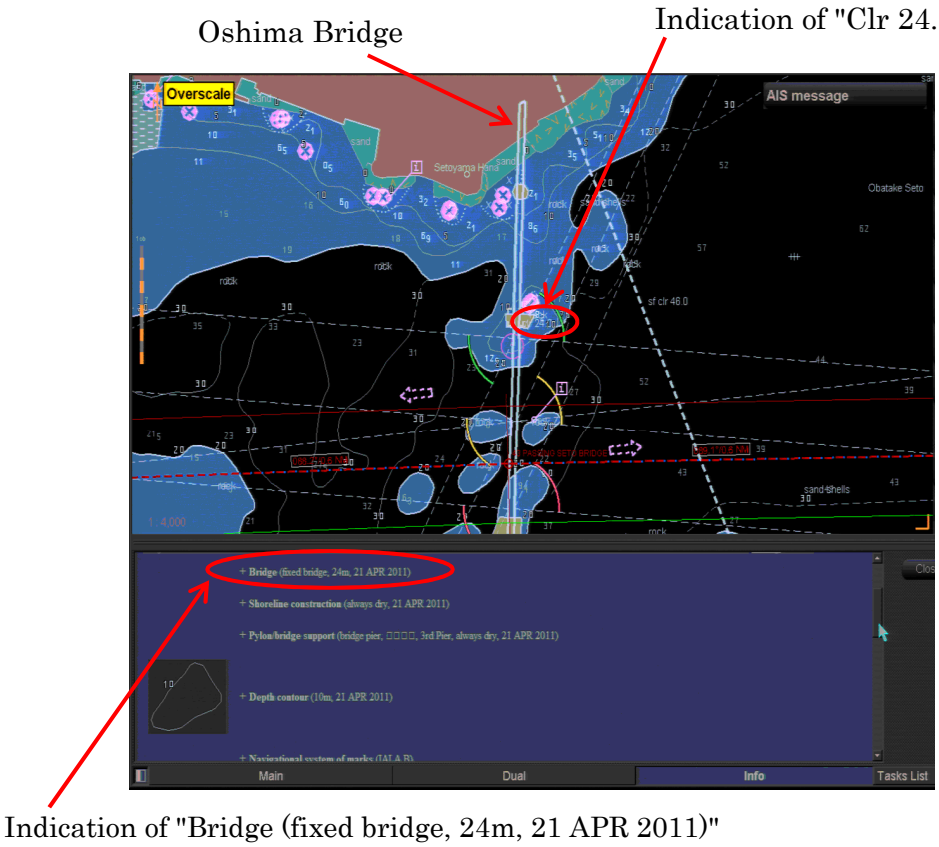


Figure 1　Image of the ECDIS screen (around 00:09:24)

2.1.3 Course of Events of the Accident according to the Statement of Crewmembers, etc.

According to the statements of the Master A, Navigation Officer A_1, Third Officer (hereinafter referred to as "Navigation Officer A_2") and Able Seaman A of the Vessel and the person in charge of the owner's agent that was hired for navigation of Kanmon Kaikyo strait (hereinafter referred to as "Owner's agent") , the replies to the questionnaire by the OLDENDORFF Carriers GmbH & Co.KG (hereinafter referred to as "Company A") as well as the information by the Japan Coast Guard (JCG), the situation was as follows.

The Vessel departed from Kuwinana, Australia, on September 24, 2018 and arrived at the Port of Onsan, Republic of Korea on October 19, by way of Isabel, Republic of the Philippines and Qingdao, People's Republic of China.

At around 08:30 on October 21, the Vessel, with a master and a second officer (both of national of the Republic of Indonesia), and nineteen other crewmembers (ten nationals of the Republic of Indonesia, four nationals of the Republic of the Philippines, two nationals of the Russian Federation, one national of the Republic

of Turkey, one national of India, and one national of the Republic of Ghana) aboard, left the Port of Onsan for privately-operated berth in Etajima City, Hiroshima Prefecture.

As the Vessel was navigating off the west of Heigun To, Yanai City, Yamaguchi Prefecture, Master A arrived on the bridge in preparation for the Vessel's passage through a narrow channel near Yashiro Shima, Suo-Oshima Town, Yamaguchi Prefecture. Master A personally conned the Vessel and assigned Navigation Officer A_2 to lookout and an able seaman to ship maneuvering, and continued navigating.

As the Vessel was proceeding north off the west coast of Yashiro Shima, Master A began to feel uncertain about the height of Oshima Bridge, which the Vessel would soon pass. At around 00:00 on October 22, Master A ordered Navigation Officer A_1, who had taken over navigational watch from Navigation Officer A_2, to check the bridge's height.

Receiving the order from Master A, Navigation Officer A_1 attempted to search the information of Oshima Bridge and check the bridge's height using the index at the end of the Sailing Directions but he could not find a part that contained that information.

When the Vessel began turning to starboard off the west of Kasasa Shima, after proceeding north off the west coast of Yashiro Shima, although Master A and Navigation Officer A_1 sighted Oshima Bridge's lights, they continued navigating without being able to confirm the bridge's height because the area was dark.

Master A considered reducing speed because he could not confirm the bridge's height. However, he was concerned that the Vessel would be pushed by the current, which was flowing toward the west, and he continued proceeding east with the engine set at half ahead.

As the Vessel was proceeding east through Obatake Seto, Navigation Officer A_1 sensed danger when he got sight of Oshima Bridge's entire form just before arriving at the bridge and he immediately shouted for the rudder to be hard to starboard.

After Able Seaman A set the rudder hard to starboard, Master A ordered the rudder returned to avoid the Vessel from approaching the shore on the starboard side. However, shortly afterward the No. 1 crane collided with Oshima Bridge and then, although No. 2 crane passed under the bridge, the No. 3 crane, No. 4 crane, and aft mast subsequently collided with Oshima Bridge in that order.

After the Vessel passed under the bridge and settled her course, Master A contacted Owner's agent by telephone and asked the agent to report the accident to JCG. However, Owner's agent could not catch what Master A said and therefore the accident was not reported to JCG.

At around 01:30, JCG was informed by a vessel navigating Obatake Seto about abnormalities at Oshima Bridge and then sent a patrol boat to the accident site to confirm damages to Oshima Bridge.

The Vessel subsequently continued navigating and at around 04:00 let go anchor in a quarantine anchorage off of Kure Port, Kure City, Hiroshima Prefecture because Master A could not find a suitable anchorage nearby the accident site and thought that it would be safe to anchor at an anchorage near the originally planned destination. After that, at around 07:00, the Vessel was called by JCG with the international VHF radio telephone equipment to confirm the collision with Oshima Bridge.

The date and time of occurrence of the accident was at around 00:27 on October 22, 2018, and the location was around 058°, 875m from the Oiso Lighthouse, Suo-Oshima Town.

(See Annex Figure 1-1 Navigation Track (Overall), Annex Figure 1-2 Navigation Track (Near Yashiro Shima), Annex Figure 1-3 Navigation Track (Near Oshima Bridge))

2.2 Injuries to Persons

According to the reply to the questionnaire by Company A, there were no fatalities or injuries on the Vessel.

2.3 Damage to Vessel

According to on-site investigation and the reply to the questionnaire by Company A, the Vessel suffered dents and other damage to No.1 crane, No.3 crane and No.4 crane of her four cargo cranes installed on the deck (referred to as No. 1 crane to No. 4 crane in order from the bow), and a bent damage to her aft mast installed on the bridge. (See Figure 2)

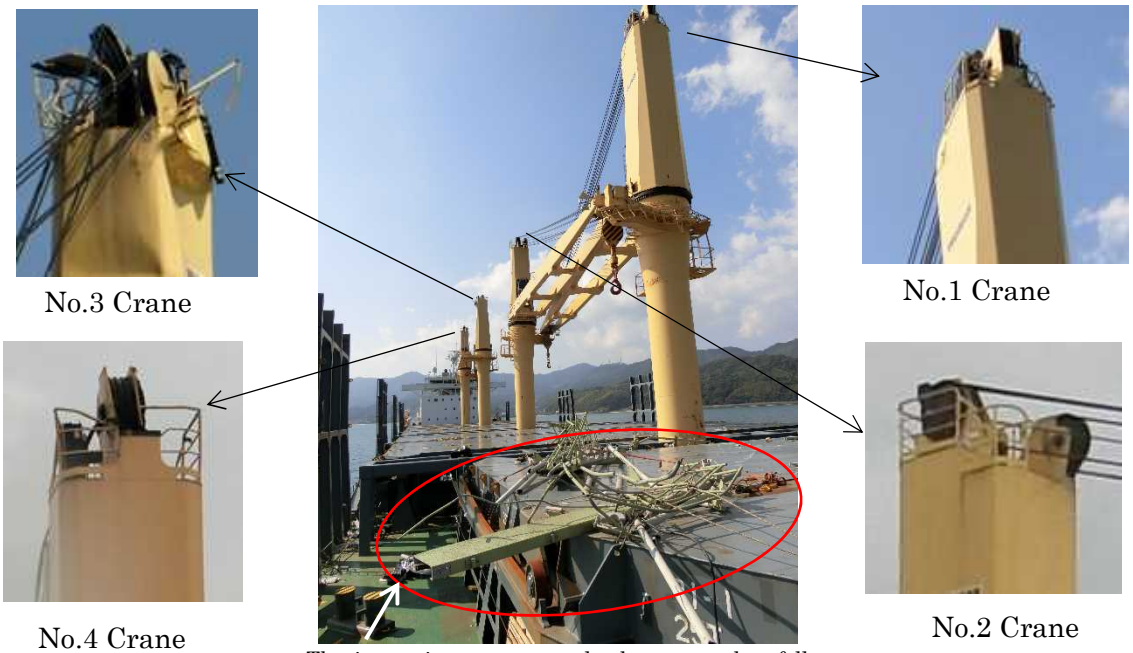


Figure 2 Damage to the Vessel

2.4 Damage to Other Facilities

According to the statement and the replies to the questionnaire by the person in charge of the Yamaguchi Prefecture, Suo-Oshima Town, the water supply utility, the electric power company, the telecommunication company, the maintenance service provider for bridge equipment, the situation was as follows.

Oshima Bridge suffered cracks, dents, and other damage to its girders; an inspection passage that was installed under the girders was broken and fell, and a water pipe, power cables, telecommunication cables, etc. were severed; causing a

water outage damaging 9,046 houses, 14,590 people and regional industries that lasted for approximately forty days in almost all area of Suo-Oshima Town; causing a temporary power outage, communication failures of the Internet and mobile phones etc., in some part of Suo-Oshima Town. (See Figure 3)

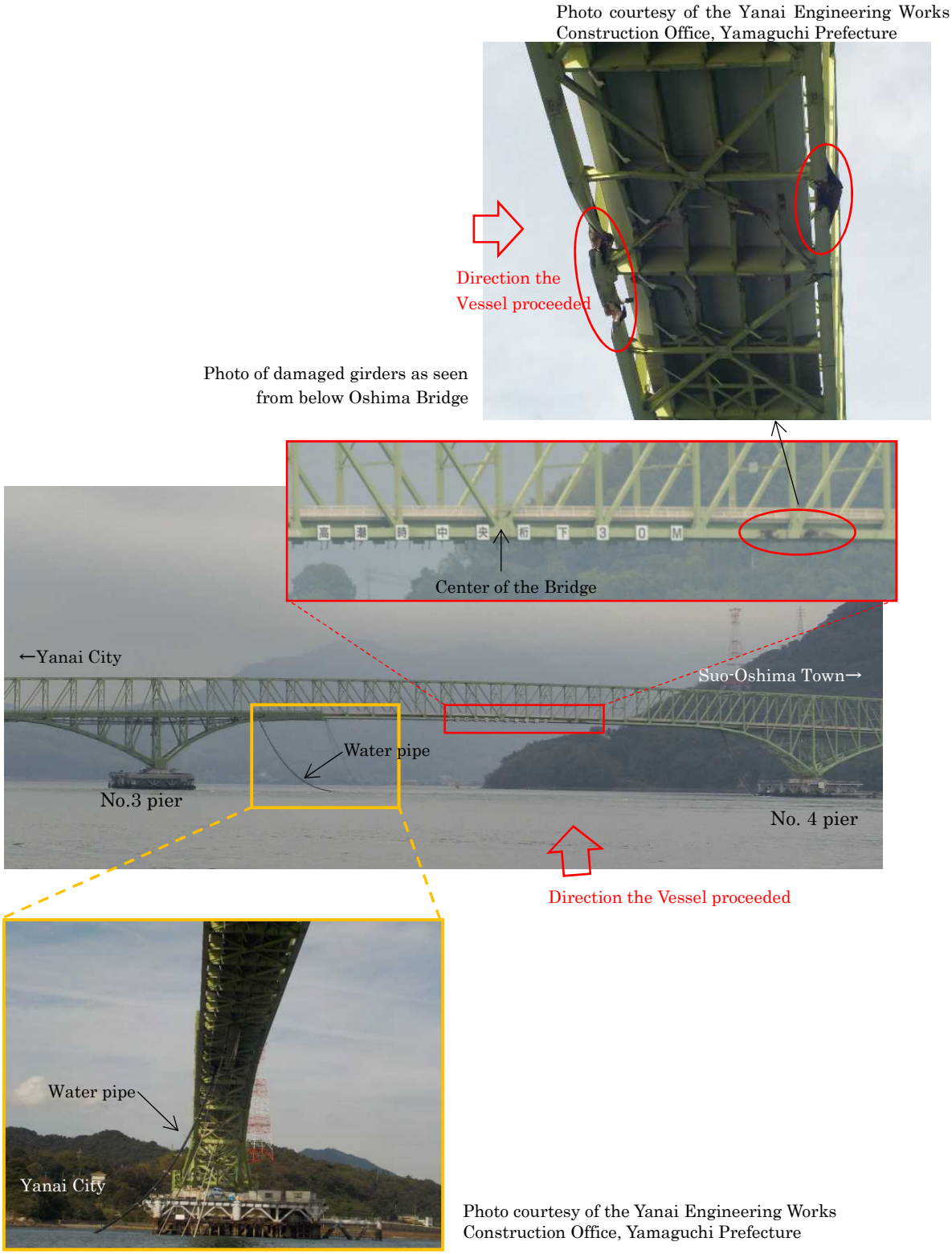


Figure 3　Damage to Oshima Bridge

2.5 Crew Information

(1) Gender, Age, Certificate of Competence

1) Master A: Male, 44 years old, national of the Republic of Indonesia

Endorsement attesting the recognition of certificate under STCW regulation I/10: Master (issued by the Republic of Malta)

Date of issue: July 28, 2015 (Valid until February 4, 2020)

2) Navigation Officer A_1: Male, 26 years old, national of the Republic of Indonesia

Endorsement attesting the recognition of certificate under STCW regulation I/10: Chief Mate (issued by the Republic of Malta)

Date of issue: December 15, 2017 (Valid until February 24, 2019)

(2) Sea-going Experience, etc.

According to the statements and the replies to the questionnaire by Master A and Navigation Officer A_1 as well as the replies to the questionnaire by Company A, the situation was as follows.

1) Master A

Master A became a seaman in 1998 and began to serve as a master in 2016 after joining Company A in 2014.

Master A joined the Vessel on October 16, 2018 in Qingdao in place of the former master.

Although it was the first time for Master A to join the Vessel, he had served as a master on the same type of vessels a couple of times.

Although it was the first time for Master A to navigate the Otabake Seto at the time of the accident, he had many experiences of navigating the Seto Inland Sea.

Master A was in good health at the time of the accident.

2) Navigation Officer A_1

Navigation Officer A_1 became a seaman in 2012 and joined Company A in 2016.

It was the first time for Navigation Officer A_1 to serve as a second officer when he joined the Vessel on July 22, 2018.

Navigation Officer A_1 had joined the Vessel once in the past and had served on the same type of vessels a couple of times.

Although it was the first time for Navigation Officer A_1 to navigate the Otabake Seto at the time of the accident, he had experiences of calling in Japan.

Navigation Officer A_1 was in good health at the time of the accident.

2.6 Vessel Information

2.6.1 Particular of the Vessel

IMO number:	9717670
Port of registry:	Valletta, Republic of Malta
Owner:	Company A (Federal Republic of Germany)
Management Company:	Company A
Classification Society:	DNV GL
Gross tonnage:	25,431 tons
L×B×D:	179.99m×30.01m×15.13m
Hull material:	Steel
Engine:	Diesel engine×1
Output:	6,050 kW
Propulsion:	Fixed pitch propeller×1
Year of construction:	2016

(See Photo 1)

Photo 1　The Vessel

2.6.2 Load Conditions

According to the statement of Master A and the replies to the questionnaire by Company A, at the time of the accident the Vessel was loaded with approximately

6,300 tons of aluminum oxide, and she had a draft of approximately 5.95 meters at the bow and approximately 6.97 meters at the stern.

Additionally, according to the Vessel's particulars, the maximum draft of the Vessel was approximately 10.5 meters.

2.6.3 Information relating to Vessel Equipment

(1) Vessel's Structures

According to on-site investigation and the Vessel's general arrangement plan, the Vessel is a cargo ship with five cargo holds and a docking bridge; 'the heights above the water line at the time of the accident to the top of each cargo crane installed on the deck and to the top of the aft mast installed above the bridge' (hereinafter referred to as "the height of crane and mast") were as follows. (See Figure 4)

	Height above the water line
No. 1 and No. 2 cranes	Approx. 34 m
No. 3 and No. 4 cranes	Approx. 35 m
Aft mast (including antenna)	Approx. 42 m (the Vessel's air-draft*5)

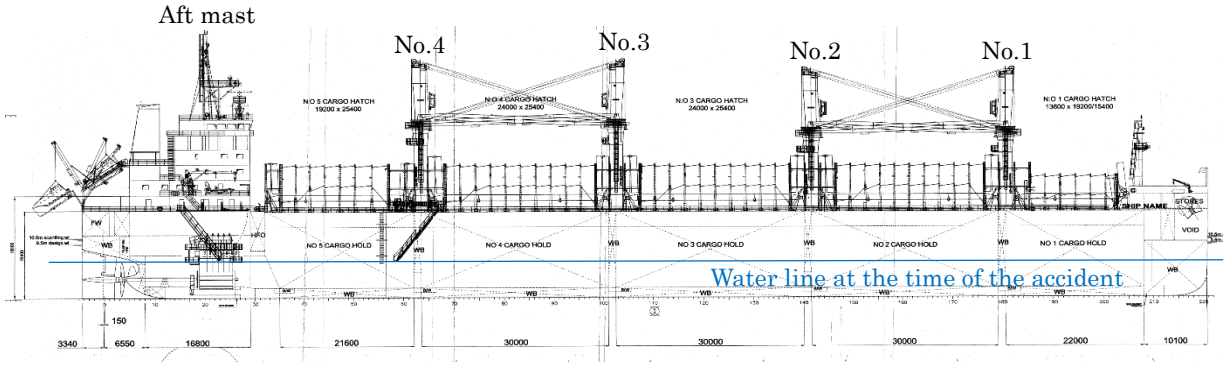


Figure 4 General Arrangement of the Vessel

According to on-site investigation, on the whiteboard in the Vessel's bridge, the Vessel's draught, air-draught etc. at the time of departure of Port of Onsan were displayed. (See Photo 2)

*5 "Air draft" refers to the height from the ocean's surface to the highest point of the vessel's structures.

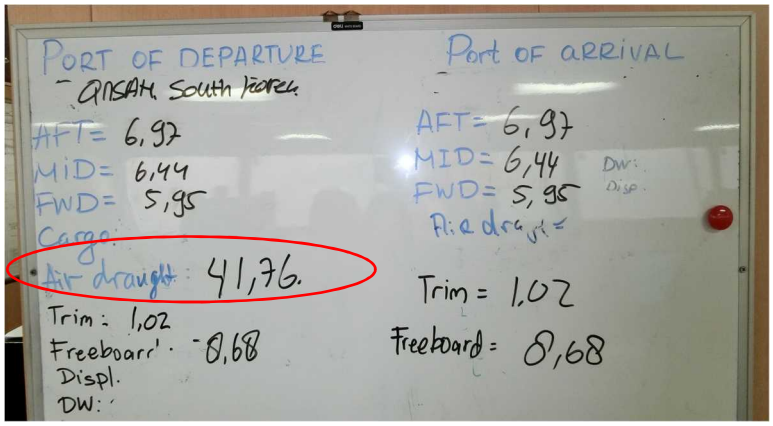


Photo 2　Air-draught, etc. displayed in the Vessel's bridge

According to the statement of Master A and Navigation Officer A_1, they were aware of the Vessel's air-draught.

According to the statement of Master A and the replies to the questionnaire by Company A, there was no malfunction or failure in the hull, engine and machineries at the time of the accident.

(2)　Vessel's bridge

According to on-site investigation and the replies to the questionnaire by Company A, there were a steering unit with a helm, a main engine remote controller, etc. at the center of the Vessel's bridge, on the each side of which were installed radars, and then there was the No.1 ECDIS next to the starboard side radar. Also, there was a chart table in the aft part of the bridge, on the port side of which was installed the No.2 ECDIS.

As the Vessel had two ECDISs including a backup as defined in 2.1[*6], regulation 19, Chapter V, Annex of SOLAS Convention[*7], she did not have paper charts.

(See Figure 5 The Vessel's bridge)

[*6] The regulation requires ships to have paper charts or other back-up arrangements including another ECDIS when carrying ECDIS to meet a chart carriage requirement.

[*7] "SOLAS Convention" is the abbreviation for "The International Convention for the Safety of Life at Sea" of 1974.

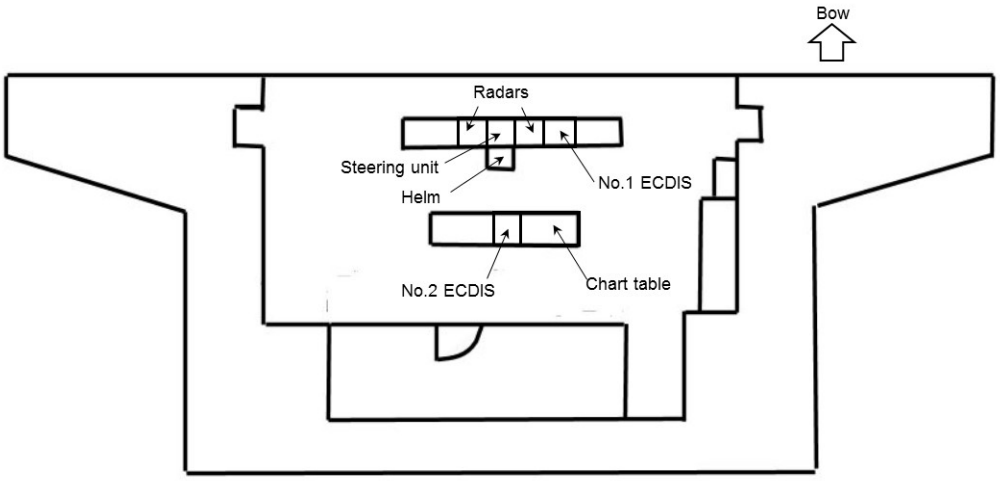


Figure 5 The Vessel's bridge

(3) Functions of ECDIS

According to the replies to the questionnaire by Company A and the instruction manual of the ECDIS, two ECDISs installed on the Vessel's bridge (hereinafter referred to as "the ECDIS"), complying with MSC. 232(82) of International Maritime Organization (IMO) resolution that sets the performance standard for ECDIS (hereinafter referred to as "the performance standards"), were the same model made by the same manufacturer.

The ECDIS, as required by the performance standards, had a function checking the planned route to detect navigational hazards including bridges existing on the route, if any, and displaying alerts during voyage planning (hereinafter referred to as "the route check function").

Additionally, the ECDIS, although not required by the performance standards, had a function displaying alerts by referring to the data of the height of bridges or overhead cables existing on the planned route on electronic navigational charts (ENCs), if data of vessel's height and draught was inputted (hereinafter referred to as "the height check function").

(4) Maneuverability

According to the sea trial measurement report and the wheelhouse poster posted in the bridge, the Vessel's maneuverability at normal ballast condition (fwd draught of approx.4.8 meters, aft draught of approx. 6.3 meters) was as follows.

1) Vessel's speed

Engine order	Number of Engine Revolution (rpm)	Vessel's speed (kn)
Navigation full ahead	99	15.06
Full ahead	82	13.17
Half ahead	66	11.28
Slow ahead	45	8.58
Dead slow ahead	40	7.89

2) Turning performance (at rudder angle 35°)

	Starboard turn (initial speed: 12.9kn)	Port turn (initial speed: 13.5kn)
Advance at turning 90° (required time)	Approx. 543 m (2 min. 10 sec.)	Approx. 559 m (2 min. 02 sec.)
Transfer at turning 180° (required time)	Approx. 441 meters (4 min. 22 sec.)	Approx. 463 m (3 min. 52 sec.)

3) Stopping performance

When ordered full astern while navigating with full ahead (14.3 kn), required distance and time to stop the Vessel: 2,116 meters (593 sec.)

2.7 Information concerning Oshima Bridge

According to "Sailing Directions for Seto Naikai" issued by JCG, Oshima Bridge is a bridge spanning the narrowest part of Obatake Seto, and there are many dangerous sunken rocks between the west of this narrowest part and Kasasa Shima. Oshima Bridge is 24 to 30 meters high[*8], and the space between the No. 3 and No. 4 piers at the center of the bridge is a waterway with a width of approximately 290 meters. It is also reported that many of vessels navigating through Obatake Seto are less than 500 tons and there are many small fishing boats in operation.

According to information of Oshima Bridge's general bridge plan and the Yamaguchi Prefecture storm surge disaster prevention information system, the height from the ocean's surface at the time of the accident to Oshima Bridge (lower edge of the inspection passage installed under the girders) was approximately 33 meters at the highest point. (See Figure 7)

[*8] The "height" of a bridge appearing on a chart, sailing directions, etc., is the height from the highest water level to the lowest part of the bridge.

In addition, according to the statement and replies to the questionnaire by the person in charge of the Yamaguchi Prefecture, the situation before the accident which the inspection passage, etc. had been installed under the girder around the damaged point was as shown in Figure 8.

(See Figure 6, Figure 7)

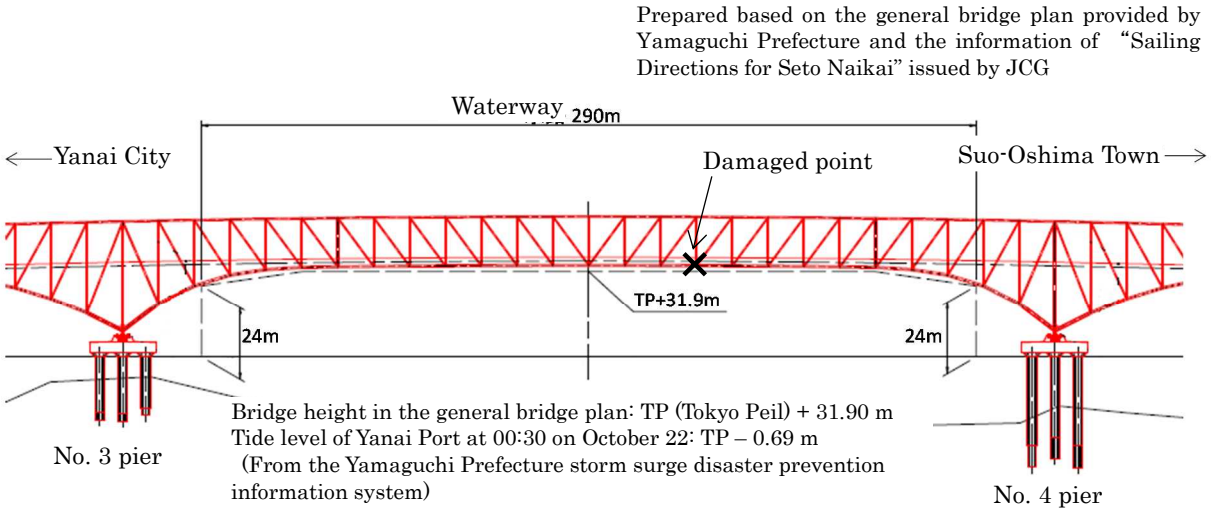


Figure 6 Oshima Bridge

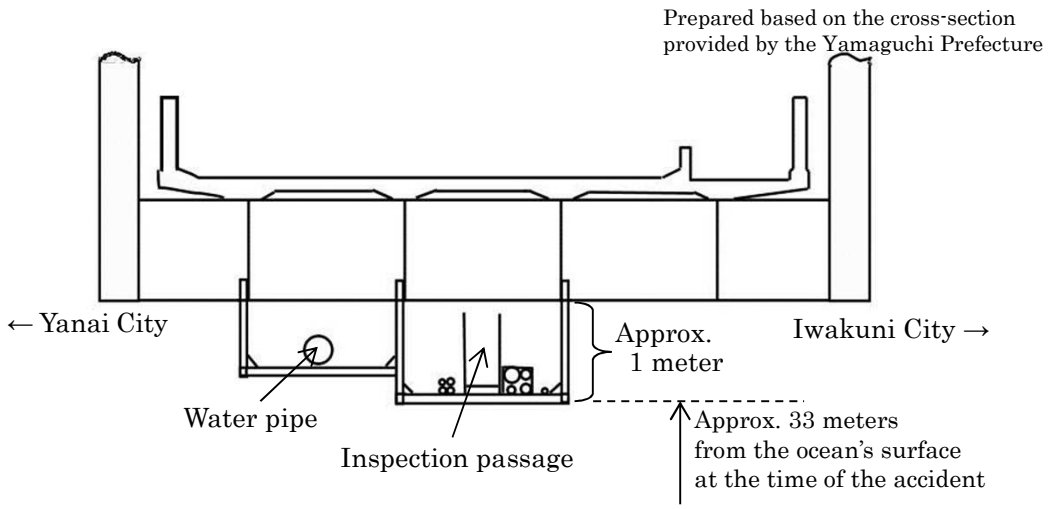


Figure 7 Cross-section of Oshima Bridge
(Conceptual image)

2.8 Information concerning Voyage Planning, etc.

2.8.1 Statement of Crewmembers, etc.

According to the statements and the replies to the questionnaire by Master A and Navigation Officer A_1 as well as the replies to the questionnaire by Company

A, the situation of voyage planning before the accident was as follows.

Navigation Officer A_1 did not consult the information concerning Obatake Seto in the Sailing Directions when preparing the voyage plan.

Navigation Officer A_1 used the software (hereinafter referred to as "the Software"), which was installed on the computer of the Vessel for the purpose of managing and ordering ENCs, when preparing the route from Onsan to Etajima.

Navigation Officer A_1 imported the data of 'the route from Onsan to Etajima by way of Obatake Seto' (hereinafter referred to as "the Route"), which was automatically created by the Software, into ECDIS and then, although he used the route check function and was aware of a number of alerts including for shallow waters displayed on the ECDIS, he overlooked the alert for Oshima Bridge.

Navigation Officer A_1 prepared the route including Isabel – Qingdao – Onsan – Etajima and asked the former master to check it about a week and a half before the accident. Although the former master checked the details of the route from Isabel to Qingdao and signed the voyage plan, he only checked the other part of the route roughly.

The Route had been already prepared when Master A joined the Vessel on October 16, 2018 in Qingdao.

While the Vessel was berthing at the Port of Onsan, Master A checked the Route together with Navigation Officer A_1 and noticed that there were some bridges including Oshima Bridge on the Route displayed on the ECDIS. At that time, Master A did not check the details of the Route such as consulting the Sailing Directions, surveying the alerts of the route check function on the ECDIS because he thought that the former master would have already checked it. After the accident, Master A thought that he was supposed to check the details of the Route because he was responsible for voyage planning.

Master A and Navigation Officer A_1 did not usually use the height check function.

There were signs of Master A and Navigation Officer A_1 dated October 20, 2018 on the voyage plan at the time of the accident.

On the afternoon of October 21 after leaving Port of Onsan, Master A and Navigation Officer A1 rechecked the Route on the ECDIS, however they were not aware of the height of Oshima Bridge.

According to the replies to the questionnaire by Company A, Company A does not usually intervene in voyage planning conducted by each vessel and did not

grasp the voyage plan of the Vessel at the time of the accident because Company A believes that a voyage planning is conducted under the wide range of authority and responsibility of vessel's master regarding the safety of the vessel.

2.8.2 Verification of the ECDIS data

The results of verification for the data of the Route at the time of the accident recorded in the ECDIS, which was conducted after the accident, were as follows.

(1) The route check function

When the route check function was executed for the data, the alert was displayed for Oshima Bridge including 24m of the bridge's height as the related information. (See Figure 8)

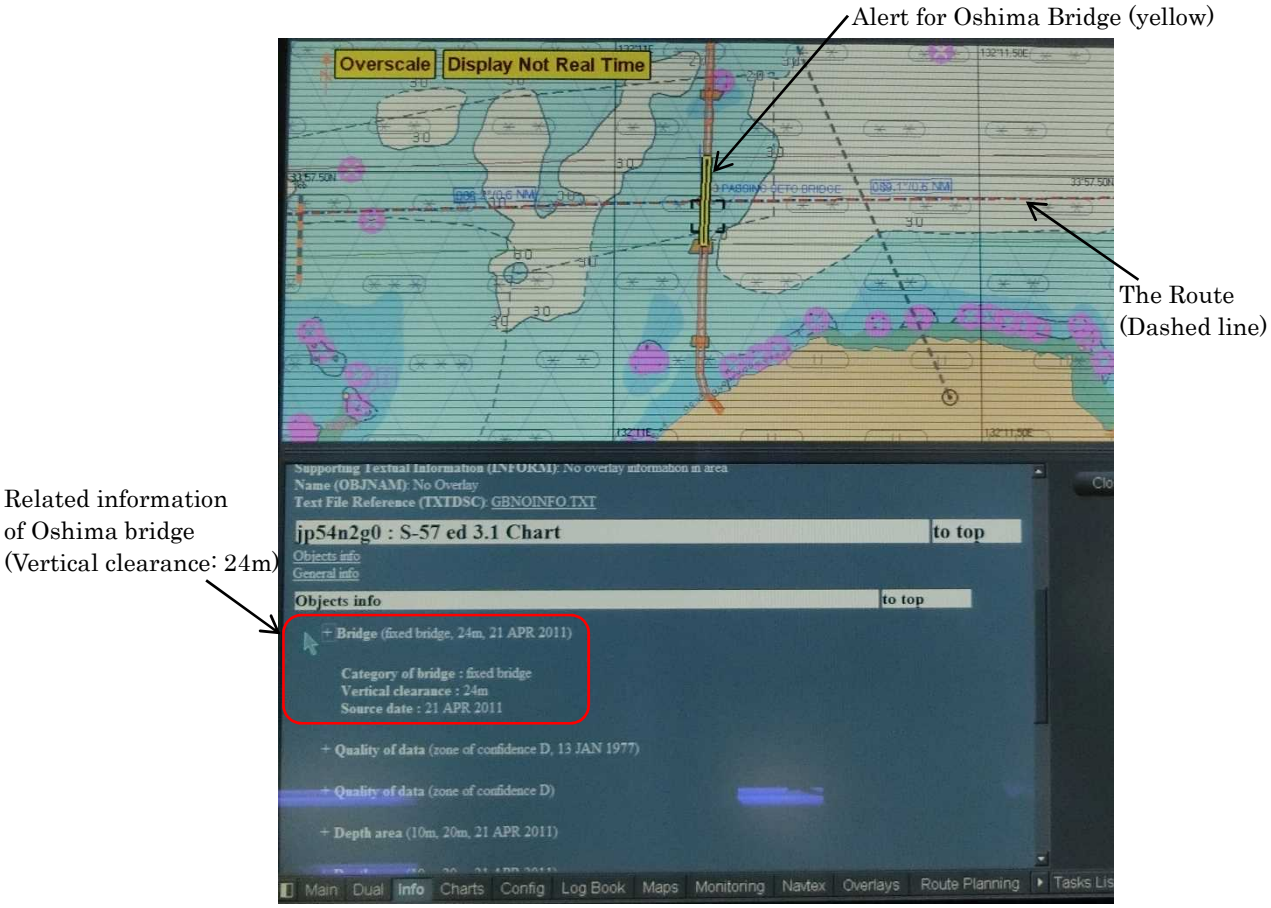


Figure 8 Alert by the route check function

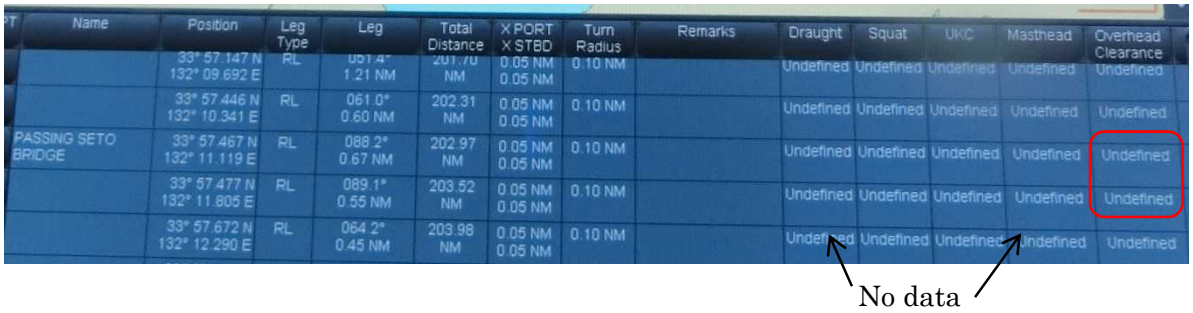
(2) The height check function

When the height check function was executed for the data (no data of "Masthead" and "Draught"), "Undefined" was displayed in the "Overhead Clearance" column when passing Oshima Bridge.

On the other hand, when the height check function was executed for the same

data additionally inputted the data of "Masthead" and "Draught" of the Vessel, "Not Passed" was displayed in the column. (See Figure 9)

<No data of "Masthead", "Draught" (same as at the time of the accident)>



<Additional input "Masthead", "Draught">

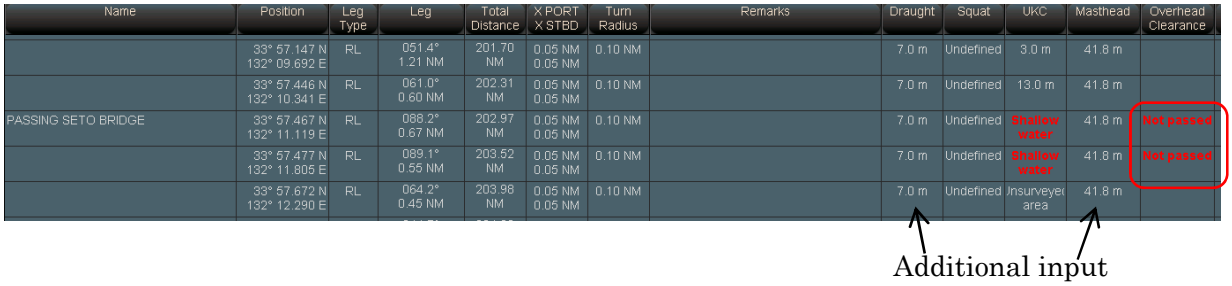


Figure 9 Alert by the height check function

2.8.3 Information concerning the Sailing Directions

According to the Sailing Directions, the information concerning Obatake Seto is shown as the Attached Figure 2-1 and 2-2. The height of Oshima Bridge was included in page 159 as "Vertical Clearance (6.167)" of Obatake Seto. (See Attached Figure 2-1 The Sailing Directions (Obatake Seto)

On the other hand, when searching "Oshima Bridge" with the index at the end of the Sailing Directions as Navigation Officer A_1 did so at the time of the accident, 6.175 (page 160) including the information of colors, lights, etc. as well as a photography of Oshima Bridge is specified, however there is no information about vertical clearance in this page.

2.9 Information concerning Safety Management, etc.

According to the replies to the questionnaire by Company A, the situation was as follows.

2.9.1 Document of Compliance and Safety Management Certificate

Company A was issued the Document of Compliance (DOC) and the Vessel

was issued the Safety Management Certificate (SMC) in compliance with the International Safety Management (ISM) Code [*9] respectively by the classification society.

2.9.2 Procedures concerning Voyage Planning, etc.

In the Safety Management Manual of Company A, it was specified that the preparation of the voyage plan is a function of the second officer.

Additionally, procedures of voyage planning, etc. were specified in the Safety Management Manual and Work Instruction for ECDIS of Company A as follows.

(1) Safety Management Manual

The Master and the officer-of-the-watch shall make careful reference to the "Sailing Directions" (Pilot Books) before and during all stages of a voyage, particularly when approaching a foreign coastline.

The voyage plan must always be checked by the Master. That is especially required for voyage plans generated with ECDIS.

The Master shall check the voyage plan personally to make sure the plan is correct. This is confirmed by his signature on the voyage plan.

(2) Work Instruction for ECDIS

The voyage planning process shall begin using small scale ENCs (ENC Bands 1 and 2 – Overview and General), outlining a basic route before moving to medium scale ENCs (ENC band 3- Coastal), bringing in more detail to refine the overall plan and edit legs of the voyage as proximity to the safety contour decreases; before finally moving to large scale ENCs (ENC Bands 4, 5 and 6 – approach, harbor and berthing) to prepare the final approach to the port and pilotage/berthing detail.

After the intended route has been planned and entered into the ECDIS, and carefully visually checked along the full length of the route by the responsible

*9 "The International Safety Management Code for the Safe Operation of Ships and for Pollution Prevention" (ISM Code) was adopted by the International Maritime Organization (IMO) on November 4, 1993, for the purposes of ensuring the safe navigation of vessels and protecting the environment. It was incorporated into the Annex of the 1974 SOLAS Convention and entered into effect on July 1, 1998, following a revision of the SOLAS Convention in 1994. It applies to all passenger vessels as well as all vessels with a gross tonnage of 500 tons or more that engage in international navigation.

navigational officer and the master at the scale at which the ENC data was compiled ("Optimum scale" or "Compilation scale"- see also respective ENC Pick Report), the planned route shall be double-checked using the Route Checking function offered by the ECDIS.

Each generated Checking Alert is to be carefully, responsibly and professionally checked and evaluated. Where/When deemed necessary, the intended route is to be modified accordingly, after which visual inspection of changes followed by renewed Route Checking is to be repeated until the final result is satisfying and acceptable.

2.9.3 Handling of the Software and the height check function

According to the replies to the questionnaire by Company A, handling of the Software and the height check function in the Company A were as follows.

Company A had installed the Software on the computer of the Vessel for the purpose of managing and ordering ENCs. The Software had a function to automatically create a route between two points, but it was a simple one that did not consider navigational hazards such as bridges.

In the Safety Management Manual, etc. of Company A, there was no description instructing crewmembers clearly to use the height check function.

2.9.4 Education/Training of Crewmembers

Company A has all employed masters and navigation officers receive the generic training for ECDIS required by the STCW convention[*10] and the type specific training by ECDIS manufacturers. Master A received the generic training in January 2013 and the type specific training in December 2014 respectively. Navigation Officer A_1 received the generic training in July 2014 and the type specific training in March 2016 respectively.

Additionally, Company A dispatches ECDIS specialists to its vessels to conduct ECDIS training including voyage planning for crewmembers.

2.10 Weather and Sea Conditions

[*10] "STCW (The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers)" is an international convention on the standards of training, certification, and watchkeeping for crews established in 1978.

2.10.1 Meteorological observations and Tide

(1) According to meteorological observations at the Kure Special Regional Meteorological Observation Station, which is located approximately 24.8 nautical miles (M) northeast from the accident site, the weather was clear and visibility was 20.0 km at 00:00 and 01:00 on October 22.

Additionally, meteorological observations at the Yanai Regional Meteorological Observation Station, which is located approximately 3.6 M west from the accident site, were as follows:

October 22

00:00 Temperature: 12.9°C; Wind Speed: 1.0 m/s;
Wind direction: West; Precipitation: 0.0 mm

00:30 Temperature: 11.6°C; Wind Speed: 1.0 m/s;
Wind direction: West-northwest; Precipitation: 0.0 mm

01:00 Temperature: 11.1°C; Wind Speed: 1.0 m/s;
Wind direction: West-northwest; Precipitation: 0.0 mm

(2) According to the tide table published by JCG, the tide was at the end of outgoing tide and the height was 110cm, and the current was a westerly current at a speed of 2.8 kn at the time of the accident in Obatake Seto.

2.10.2 Observations by Crewmembers

According to the statement of Master A, the weather was clear, the sea surface was calm and the visibility was good.

3 ANALYSIS

3.1 Situation of the Accident Occurrence

3.1.1 Course of Events

The following analysis is based on 2.1

(1) It is probable that at around 08:30 on October 21, 2018, the Vessel, with Master A, Navigation Officer A_1 and nineteen other crewmembers aboard, left the Port of Onsan for a privately-operated berth in Etajima City.

(2) It is probable that as the Vessel was navigating off the west of Heigun To, Master A arrived on the bridge and personally conned the Vessel, and then the Vessel proceeded north off the west coast of Yashiro Shima.

(3) It is probable that as the Vessel was proceeding north off the west coast of Yashiro Shima, Master A began to feel uncertain about the height of Oshima Bridge and ordered Navigation Officer A_1 to check the bridge's height at around 00:00 on October 22.

(4) It is highly probable that the Vessel turned to starboard off the west of Kasasa Shima and continued proceeding east, and then at around 00:27 collided with Oshima Bridge.

3.1.2 Situation of the Collision

Based on 2.1, 2.3, 2.4, 2.6.3(1) and 2.7, it is probable that the situation was as follows.

The Vessel, with her heading of approximately 100° and a speed over the ground of approximately 7 kn, entered Oshima Bridge; her No.1 crane collided with the inspection passage, etc. installed under the girder of Oshima Bridge, and brought it down; although her No.2 crane passed through under the girder in which the inspection passage, etc. was brought down, No.3 crane, No.4 crane and aft mast subsequently collided with the girder of the Oshima Bridge in order.

3.1.3 Date, Time and Location of the Accident Occurrence

Based on 2.1, it is highly probable that the date and time of occurrence of the accident was at around 00:27 on October 22, 2018, and the location was around 058°, 875m from the Oiso Lighthouse.

3.1.4 Damage, etc.

Based on 2.3 and 2.4, the damage, etc. were as follows.

(1) It is certain that the Vessel suffered dents and other damage to her No.1 crane, No.3 crane and No.4 crane, and a bent damage to aft mast.

(2) It is probable that Oshima Bridge suffered cracks, dents, and other damage to its girders; an inspection passage that was installed under the girders was broken and fell, and a water pipe, power cables, telecommunication cables, etc. were severed; causing a water outage damaging 9,046 house and 14,590 people and regional industries, lasted for approximately forty days almost all

area of Suo-Oshima Town; causing a power outage, communication failures of the Internet and mobile phones etc., in some part of Suo-Oshima Town.

3.1.5 Fatalities and Injuries

Based on 2.2, it is highly probable that there were no fatalities and injuries on the Vessel.

3.2 Causal Factors of the Accident

3.2.1 Situation of Crewmembers

Based on 2.5, it is certain that Master A and Navigation Officer A_1 possessed a legally valid endorsement attesting the recognition of certificate under STCW regulation I/10. Additionally, it is probable that they were in good health at the time of the accident.

Based on 2.9.4, it is certain that Master A and Navigation Officer A_1 had received the generic training for ECDIS required by the STCW convention and the type specific training by ECDIS manufacturers.

3.2.2 Condition of the Vessel

Based on 2.6.3(1), it is probable that there was no malfunction or failure with the hull, engine, or machineries at the time of the accident.

Based on 2.6.2, 2.6.3(1) and 2.10.1(2), it is highly probable that the Vessel was unable to pass through safely under Oshima Bridge regardless of her loading condition and tidal condition.

3.2.3 Weather and Sea Conditions

Based on 2.10, it is probable that at the time of the accident, the weather was clear, there was almost no wind, the sea surface was calm and visibility was good. Additionally, it is probable that at the time of the accident, the tide was at the end of outgoing tide and the height was 110cm, and the current was a westerly current at a speed of 2.8 kn.

3.2.4 Analysis of Voyage Planning, etc.

The following analysis is based on 2.5(2), 2.6.3, 2.8 and 2.9.

(1) It is probable that Master A and Navigation Officer A_1 were aware of the Vessel's air-draught when they prepared and checked the voyage plan.

(2) It is somewhat likely that Navigation Officer A_1 imported the Route data which was automatically created by the Software to the ECDIS and used it for the preparation of the voyage plan because a route between two points can be easily created by the Software.

(3) It is probable that Navigation Officer A_1 was not aware of the height of Oshima Bridge when preparing the voyage plan because he did not consult the information concerning Obatake Seto with the Sailing Directions, used the Route data to be automatically created by the Software, and overlooked the Alert for Oshima Bridge despite being aware of a number of alerts including for shallow waters by the route check function.

(4) It is somewhat likely that when the former master was asked to check the route including Isabel – Qingdao – Onsan – Etajima by Navigation Officer A_1, he did not check the details of the Route (from Onsan to Etajima) to be used for navigation after the masters' change because the former master was scheduled to change with Master A in Qingdao.

(5) It is probable that Master A was not aware of the height of Oshima Bridge when checking the voyage plan prepared by Navigation Officer A_1 because the Route had been already prepared when Master A joined the Vessel on October 16 in Qingdao, he assumed that the former master had already checked it and did not check the detail of the Route.

(6) It is probable that Master A and Navigation Officer A_1 did not usually use the height check function as well as at the time of the accident.

(7) Based on above (1) to (6), it is probable that although Master A and Navigation Officer A_1 were aware of the Vessel's air-draught, they made the voyage plan to navigate the Route (Onsan to Etajima) without being aware of the height of Oshima Bridge.

3.2.5 Analysis of Watchkeeping and Vessel Operation

The following analysis is based on 2.1, 2.6.3(4), 2.8.3, 2.10 and 3.1.

(1) It is probable that when the Vessel was proceeding north off the west coast of Yashiro Shima, Master A began to feel uncertain about the height of Oshima Bridge which the Vessel would soon pass and at around 00:00 he ordered Navigation Officer A_1 to check the bridge's height.

It is probable that, considering navigable width, depth of water and the Vessel's maneuverability, at around 00:00, the Vessel could have avoided the

collision with Oshima Bridge if Master A had taken action such as turn, slowdown or stop soon and resumed navigation after confirming the safety conditions.

(2) It is probable that after Navigation Officer A_1 was ordered to check the height of Oshima Bridge by Master A, he could not find the information of the height of the Oshima Bridge that was included in the previous page where he searched "Oshima Bridge" with the index at the end of the Sailing Directions.

(3) It is somewhat likely that Navigation Officer A_1 became upset because he was not aware of the bridge's height on the Route which he had prepared himself when he was ordered to check the bridge's height by Master A, and then he tried to check the bridge's height by consulting the Sailing Directions but could not find it.

(4) It is somewhat likely that Navigation Officer A_1 did not notice the information of the height of Oshima Bridge displayed on the ECDIS when he operated it at around 00:09 because he was upset.

(5) It is somewhat likely that Master A did not check the bridge's height himself because he waited for a report from Navigation Officer A_1 while he conned the Vessel turned to starboard off the west of Kasasa Shima.

(6) It is somewhat likely that Master A continued navigating while feeling uncertain about the bridge's height because he was concerned that the Vessel would be pushed toward shore by the westerly current in the situation that the navigable width became narrower after the Vessel turned to starboard off the west of Kasasa Shima.

(7) It is probable that, because Navigation Officer A_1 sighted the bridge's girders and sensed that the Vessel could not pass under the Oshima Bridge when the Vessel's bow approached approximately 200m from Oshima Bridge, he immediately shouted for the rudder to be hard to starboard; after the Able Seaman A set the rudder hard to starboard, Master A ordered the rudder returned; shortly afterward the Vessel collided with Oshima Bridge as described in 3.1.2.

(8) It is probable that after the occurrence of the accident, although Master A contacted Owner's Agent by telephone and asked the agent to report the accident to JCG, Owner's Agent could not catch what Master A said and therefore the accident was not reported to JCG.

(9) It is somewhat likely that Master A headed the Vessel for the anchorage

near the originally planned destination because Master A assumed that Owner's Agent would report the accident to JCG and he was not aware of a suitable anchorage nearby the accident site.

3.2.6 Analysis of Safety Management

The following analysis is based on 2.8, 2.9 and 3.2.4.

(1) It is highly probable that Company A complied with ISM code and specified the procedures of voyage planning, etc. in the Safety Management Manual and Work Instruction for ECDIS.

(2) It is probable that although Company A specified in the Safety Management Manual that the Sailing Directions shall be made careful reference particularly when approaching a foreign coastline, Master A and Navigation Officer A_1 did not properly consult the Sailing Directions when they prepared and checked the voyage plan.

(3) It is probable that although Company A specified in the Work Instruction for ECDIS that a route should be prepared and refined using different scale of ENCs step by step, Navigation Officer A_1 imported the Route data which was automatically created by the Software to the ECDIS and used it for the preparation of the voyage plan.

(4) It is probable that although Company A specified in the Work Instruction for ECDIS that a planned route shall be double-checked using the route check function of ECDIS after being checked carefully visually along the full length of the route, Master A and Navigation Officer A_1 did not execute them properly when checking the Route.

It is probable that Master A should have executed the above checks properly and made sure that the voyage plan was correct before he signed the voyage plan prepared by Navigation Officer A_1.

(5) Based on above (1) to (4), it is somewhat likely that although Company A specified the procedures of voyage planning, etc. in the Safety Management Manual and Work Instruction for ECDIS, Master A and Navigation Officer A_1 were insufficient awareness of importance of complying with them.

3.2.7 Analysis of the Accident Occurrence

The following analysis is based on 3.1 and 3.2.4 to 3.2.6.

(1) It is probable that Navigation Officer A_1 prepared the voyage plan without

being aware of the height of Oshima Bridge while being aware of the Vessel's air-draught because he did not survey the Route properly using the Sailing Directions and the ECDIS, etc.

(2) It is probable that Master A approved the voyage plan prepared by Navigation Officer A_1 without being aware of the height of Oshima Bridge while being aware of the Vessel's air-draught because Master A did not check the details of the Route assuming that the former master had already checked it.

(3) It is probable that the Vessel proceeded under Oshima bridge that the Vessel was unable to pass through at the height of crane and mast and collided with the bridge because Master A continued navigating while feeling uncertain about the bridge's height; he waited for a report from Navigation Officer A_1 after Master A ordered Navigation Officer A_1 to check the height of the bridge while the Vessel was proceeding north off the west coast of Yashiro Shima based on the voyage plan approved by Master A, and he was concerned that the Vessel would be pushed toward shore by the westerly current in the situation that the navigable width became narrower after the Vessel turned to starboard off the west of Kasasa Shima.

(4) It is somewhat likely that although Company A specified the procedures of voyage planning, etc. in the Safety Management Manual, etc., Master A and Navigation Officer A_1 were insufficiently aware of the importance of complying with them.

4 CONCLUSIONS

4.1 Probable Causes

It is probable that the accident occurred when, while the Vessel was proceeding east in Obatake Seto at night, the Vessel collided with Oshima Bridge because the Vessel proceeded under a bridge that the Vessel was unable to pass through at the height of crane and mast.

It is probable that the Vessel proceeded under Oshima Bridge which the Vessel was unable to pass through at the height of crane and mast because Master A approved the voyage plan, including the Route which was prepared by Navigation Officer A_1, without being aware of the height of Oshima Bridge, and Master A

continued navigating while feeling uncertain about the bridge's height after getting close to the bridge.

It is probable that Master A approved the voyage plan including the Route which was prepared by Navigation Officer A_1 without being aware of the height of Oshima Bridge because Master A did not check the details of the Route assuming that the former master had already checked it.

It is probable that Master A continued navigating while feeling uncertain about the bridge's height after getting close to the bridge because he waited for a report from Navigation Officer A_1 after Master A ordered Navigation Officer A_1 to check the height of the bridge, and Master A was concerned that the Vessel would be pushed toward shore by the westerly current in the situation that the navigable width became narrower after the Vessel turned to starboard off the west of Kasasa Shima.

It is somewhat likely that although Company A specified the procedures of voyage planning, etc. in the Safety Management Manual, etc., Master A and Navigation Officer A_1 were insufficiently aware of the importance of complying with them, a situation that contributed to the occurrence of this accident.

4.2 Other Identified Safety Issues

It is probable that while the Vessel was proceeding north off the west coast of Yashiro Shima, Navigation Officer A_1 could not find the information of the height of the Oshima Bridge that was included in the previous page where he searched "Oshima Bridge" with the index of the Sailing Directions.

5 SAFETY ACTIONS

It is probable that the Vessel proceeded under Oshima Bridge, which the Vessel was unable to pass through at the height of crane and mast, because Master A approved the voyage plan, including the Route which was prepared by Navigation Officer A_1, without being aware of the height of Oshima Bridge, and Master A continued navigating while feeling uncertain about the bridge's height after getting close to the bridge.

It is somewhat likely that although Company A specified the procedures of voyage planning, etc. in the Safety Management Manual, etc., Master A and Navigation Officer A_1 were insufficiently aware of the importance of complying with them, a

situation that contributed to the occurrence of this accident.

Accordingly, implementation of the following measures is necessary to prevent the occurrence of a similar accident.

(1) Crewmembers should execute in-depth surveys along the full length of the route using ENCs, sailing directions and others, especially when preparing voyage plans for waters to be navigated for the first time.

(2) Crewmembers should thoroughly review alerts generated by the route check function of ECDIS as well as check the route visually on ENCs not to overlook navigational hazards when preparing voyage plans by ECDIS.

(3) Crewmembers should properly conduct above (1) and (2) especially when they use a route which is automatically created by a computer software, etc. in the actual navigation because such software does not always consider navigational hazards, etc. on the route.

(4) Crewmembers should fully utilize the height check function, if any. In addition, ship owners should promote introduction of ECIDS with the height check function from a viewpoint of preventing crewmembers from overlooking overhead obstacles.

(5) Crewmembers should immediately take actions such as course alteration, slowdown or stop according to circumstances when feeling uncertain, etc. during navigation, and resume navigation after confirming the safety.

(6) Company A should conduct education and training for crewmembers to be executed considering the above items thoroughly.

5.1 Safety Actions Taken

5.1.1 Safety Actions Taken by Company A

(1) Company A reminded all masters to follow the company procedures for planning and checking voyage plans by ECDIS.

(2) Company A reminded all masters to properly and thoroughly crosscheck voyage plans by ECDIS including all alerts using the route check function of ECDIS.

(3) Company A decided all voyage plans to be prepared and checked using the height check function of ECDIS by entering relevant information such as air-draught, vessel draught, etc.

(4) Company A reminded all masters and navigation officers that the vessel must be slowed down and stopped and if necessary, the route must be changed to a

safer route whenever they is in doubt about a navigational hazard including a bridge.

(5) Company A revised the form regarding voyage plans in the Safety Management Manual in order to add air-draught information in it.

(6) Company A decided the Software should not to be used in preparation of voyage plans.

5.1.2 Measures Taken by Japan Coast Guard

Japan Coast Guard has called for attention to vessels installing AIS (excluding vessels that are confirmed to have navigated under Oshima Bridge in the past), heading to Obatake Seto to pass under Oshima Bridge since February 1, 2019.

(1) Attention calling by AIS message

(a) For vessels with a length of 80 m or more and less than 120 m, information about the height of Oshima Bridge (automatic transmission) is provided by AIS message.

(b) For vessels with a length of 120m or more, warning (automatic transmission) is made to check if there is a risk of collision, together with providing information about the height of Oshima Bridge by AIS message.

(2) Attention calling by VHF

For vessels with a length of 120m or more, information about the height of Oshima Bridge is provided and vessels height (height of masthead) is checked, and then, if necessary, warning is made by the international VHF radio telephone equipment.

Based on the results of the accident investigation, the Japan Transport Safety Board requests for cooperation of the Japanese Shipowners' Association, the Japan Foreign Steamship Association, the Japan Ship's Agency Association and the Japan Association of Foreign-trade Ship Agencies to disseminate this investigation report to their member companies, etc. in order to conduct proper instruction for their crewmembers considering the safety actions in this investigation report in the viewpoint that navigational hazards including bridges on the planned route needed to be checked thoroughly, especially when foreign seafarers unfamiliar with Japanese coastal area prepare a voyage plan.

6 SAFETY RECOMMENDATIONS

It is probable that ERNA OLDENDORFF proceeded under Oshima Bridge, which she was unable to pass through at the heights above the water line at the time of the accident to the top of each cargo crane and the aft mast, because the Master approved the voyage plan, including the route from Onsan to Etajima by way of Obatake Seto, which was prepared by the Second Officer, without being aware of the height of Oshima Bridge, and the Master continued navigating while feeling uncertain about the bridge's height after getting close to the bridge.

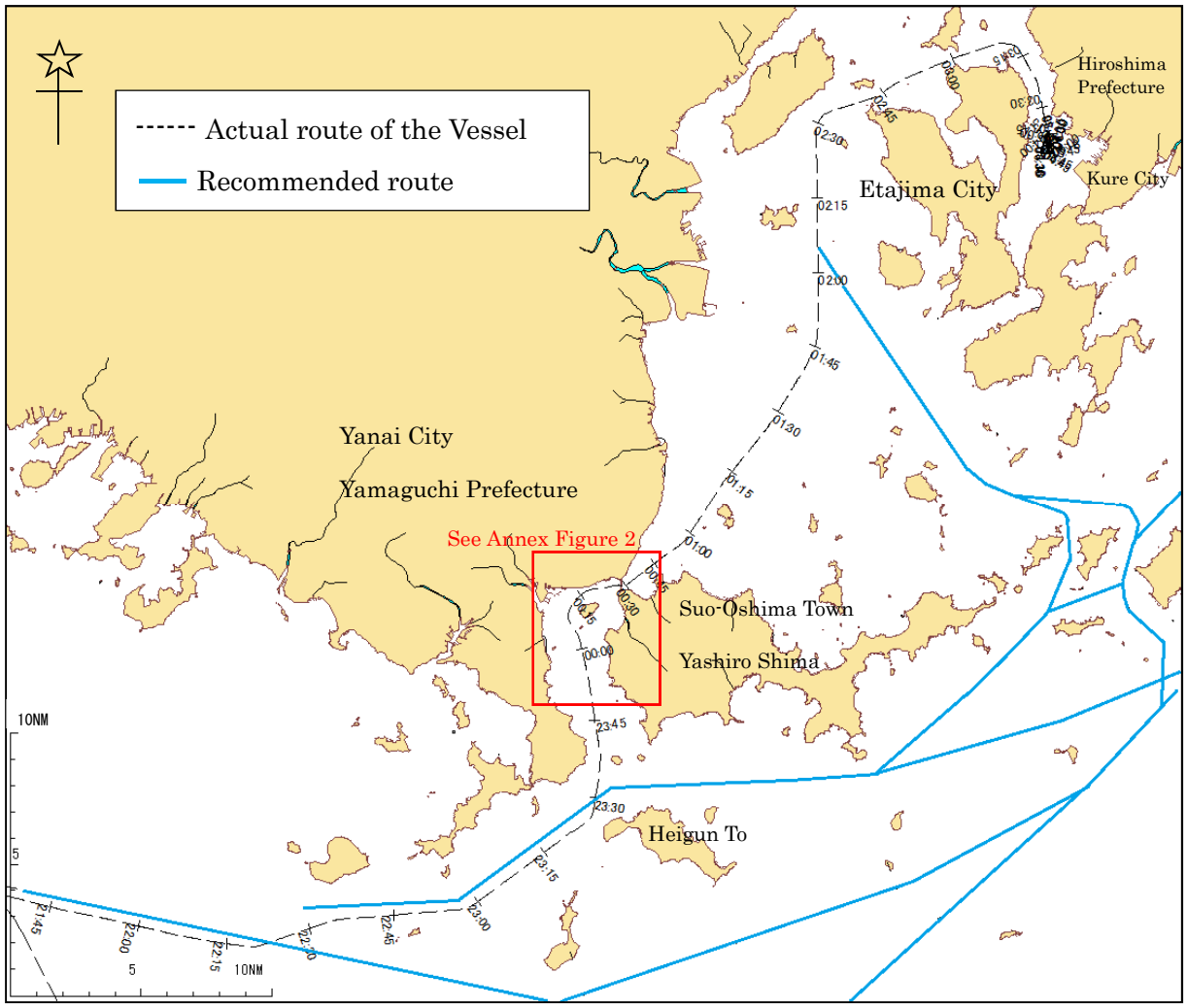
It is somewhat likely that although the OLDENDORFF Carriers GmbH & Co.KG specified the procedures of voyage planning, etc. in the Safety Management Manual, etc., the Master and the Second Officer were insufficiently aware of the importance of complying with them, a situation that contributed to the occurrence of this accident.

Therefore, based on the result of the accident investigation, the Japan Transport Safety Board recommends to the OLDENDORFF Carriers GmbH & Co.KG and the authorities of Republic of Malta as follows.

(1) The OLDENDORFF Carriers GmbH & Co.KG is recommended to thoroughly conduct education and training for masters and other crewmembers to ensure voyage planning and implementing in compliance with the Safety Management Manuals revised after the accident.

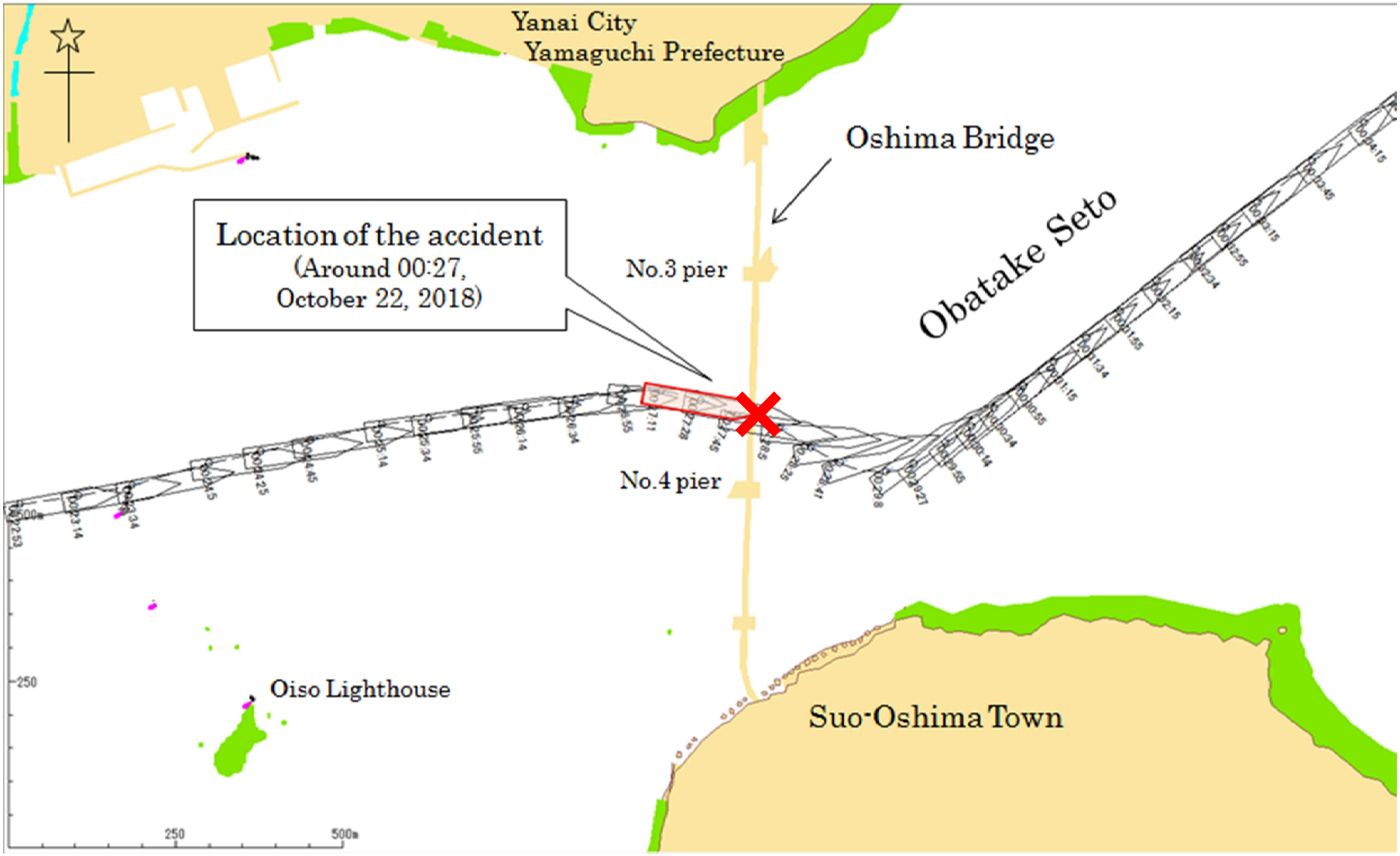
(2) The authorities of the Republic of Malta are recommended to instruct the OLDENDORFF Carriers GmbH & Co.KG to ensure proper and continuous implementation of above (1).

Annex Figure 1-1 Navigation Track (Overall)



Annex Figure 1-2 Navigation Track (Near Yahiro Shima)

Annex Figure 1-3 Navigation Track (Near Oshima Bridge)



Annex Figure2-1 The Sailing Directions (Obatake Seto)

(Index figure for routes)

OBATAKE SETO AND APPROACHES

General information

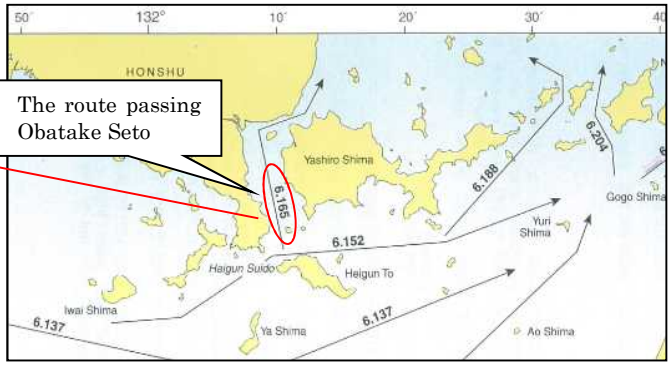
Charts JP1102, JP142, Japanese Charts W163, W152

Description

6.165

1 Obatake Seto (33°57′·70N 132°11′·57E), the shortest route between Suo Nada and Hiroshima Wan, is a narrow channel between the NW coast of Yashiro Shima (33°54′·00N 132°18′·00E), a large island separating Iyo Nada from Hiroshima Wan, and the mainland of Honshu. Obatake Seto is approached from S between Kurosaki Hana (33°50′·70N 132°09′·44E) and Hoshi Saki, 2½ miles ENE; Shimo-Ninai Shima and Kami-Ninai Shima encumber this S entrance.

2 From the vicinity of No 2 Light Buoy (safe water) (33°49′·78N 132°10′·82E), the route, marked by light buoys (safe water), initially leads NNW for about 6 miles to a position SSW of Kasasa Shima (33°56′·59N 132°09′·65E); it continues for a farther 5 miles, passing NW of Kasasa Shima, to join the designated route through Obatake Seto.



Traffic regulations

6.166

1 **Traffic separation scheme.** This traffic scheme is not IMO-adopted; the scheme is authorised under Paragraph 1 of Article 25 of the Japanese Maritime Traffic Safety Law. Vessels of 5 tonnes or more passing through Obatake Seto must follow the designated route and comply with the following instructions:

2 West bound vessels are to keep N of the centre line, shown on the chart as Line C, and pass under the bridge between its third and fourth supporting piers (the central arch); if there is no oncoming traffic it is permitted to pass midway between these piers.

3 East bound vessels are to pass N of the light buoy (N cardinal) moored close N of Kaizenji Sho (33°57′·36N 132°10′·52E) and keep S of the centre line, shown on the chart as Line C, and pass under the bridge between its third and fourth supporting piers (the central arch); if there is no oncoming traffic it is permitted to pass midway between these piers.

4 Vessels should not pass between Myojin Hana (33°57′·29N 132°11′·28E) and O Iso, 6 cables W.

Vessels navigating in Obatake Seto should proceed at reduced speed.

Overtaking, or proceeding abeam of another vessel, in the vicinity of the bridge is prohibited.

5 **Traffic regulations.** No attempt should be made to pass through the channels which lie N and S of the designated navigable channel (the cen[illegible] Oshima Bridge.

The height of the Oshima Bridge

Vertical clearances

6.167

1 Oshima Bridge (33°57′·52N 132°11′·12E), with a vertical clearance of 24 m, spans Obatake Seto; an overhead power cable, with a safe vertical clearance of 46 m, spans the channel close E of the bridge.

Navigable width

6.168

1 The channel, about 4 cables wide at its narrowest point, reduces to a navigable width under Oshima Bridge of 290 m.

Natural conditions

6.169

1 **Tidal streams.** The in-going stream sets E from about 20 minutes after LW until about 20 minutes after HW; the out-going stream is similar and sets W from about 20 minutes after HW until 20 minutes after LW. The average spring rate of the in-going stream, in the narrowest part of Obatake Seto, is about 5 kn, maximum 8 kn; the rate of the out-going stream is about half that of the in-going stream of the same tide. Vessels should take care not to be set N with the in-going stream E of Kasasa Shima, similarly S with the out-going stream; note, small vessels encountered crossing Obatake Seto may make unexpected alterations of course due to the strength of these streams.

2 **Local weather.** When a deep low pressure or typhoon passes near Obatake Seto a strong S wind may be experienced along the N coast of Yashiro Shima.

Fishing

6.170

1 Large numbers of fishing vessels may be encountered, especially at the time of slack water, when small boats engage in line fishing.

Traffic concentration

6.171

1 Traffic, particularly small vessels, is heavy throughout Obatake Seto.

Directions

Principal marks

6.172

1 **Landmarks:**

Oza San (33°51′·19N 132°08′·54E), a peak NE of Kaminoseki Kaikyo which from E appears treeless and conical.

Two pylon towers (33°57′·23N 133°07′·25E), 101 m in elevation.

Chimney (grey) (33°57′·16N 132°07′·49E), 205 m high; six LNG tanks stand close S.

2 Iino Yama (33°57′·05N 132°11′·42E) a conical peak; radio towers and an observation platform (lit) stand near its summit.

No 2 Light Buoy to Karasu Shima

6.173

1 From the vicinity of No 2 Light Buoy (safe water) (33°49′·78N 132°10′·82E) the track leads NNW, passing:

WSW of Shimo-Ninai Shima (33°50′·85N 132°10′·97E). An alternative channel, about [illegible] between Shimo-Ninai [illegible]-Ninai Shima (6.160); [illegible] Kura Iso (6.160) on the E side of this approach. A third channel, about 5 cables wide, lies between Kami-Ninai Shima and Hoshi Saki; attention is drawn to Daiha-no-Mozu (6.160) on the E side of this approach. Thence:

2 ENE of Kurosaki Hana (33°50′·70N 132°09′·44E) (6.158), thence:

ENE of Yokozoe Hana (33°51′·58N 132°09′·49E), thence:

WSW of Oshimae Hana (33°52′·29N 132°12′·00E), thence:

ENE of Kuro Saki (33°52′·48N 132°08′·87E), thence:

WSW of Ne-no-Ishi (33°53′·03N 132°10′·81E), a shoal bank extending W from Hiko Shima (33°53′·07N 132°10′·93E), a rocky islet which, viewed from W, has three summits, all surmounted by pine trees. Ko Iso (33°53′·08N 132°10′·77E), a drying rock, stands on the bank. Thence:

3 WSW of Himi Saki (33°53′·68N 132°10′·61E), a prominent treeless headland of reddish colour, thence:

ENE of Karasu Shima (33°55′·07N 132°08′·02E), a thickly wooded island on a shoal area close off the W shore of the channel; a prominent and remarkable white round rock stands close off its NE extremity.

Karasu Shima to Kaizenji Sho

6.174

1 The track then continues NNW; it then leads N and ENE for 3½ miles, passing NW of Kasasa Shima, to join the W end of the designated route through Obatake Seto, passing:

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Attached Figure 2-2 The Sailing Directions (Obatake Seto (continued))

(Index at the end of the Sailing Directions)

Information of colors, lights, etc. of the Oshima Bridge
(No information of the bridge's height)

WSW of No Shima (33°55′·91N 132°09′·32E), an islet covered in brambles, thence:

2 E of Koiketsugawa-no-Su (33°56′·21N 132°07′·96E), a narrow detached shoal close off the shore in the S part of Yanai Ko (6.178), thence:

E of Kuroshima Hana (33°56′·50N 132°07′·53E), a black rocky point, covered with pine trees, resembling an island; an observation platform stands on the point. And:

3 W of Shinbei Hana (33°56′·45N 132°09′·29E) which forms the W extremity of Kasasa Shima (33°56′·57N 132°09′·63E), a flat-topped dark coloured island, fringed with a shoal bank, and covered with pine trees, thence:

NNW of I Hana (33°56′·82N 132°09′·97E) the N extremity of Kasasa Shima, thence:

4 NNW of Oiso-no-Su (33°57′·09N 132°10′·16E), an extensive shoal area, thence:

NNW of Kaizenji Sho (33°57′·36N 132°10′·52E) the NW part of a rocky reef extending NW from O Iso; a light buoy (N cardinal) is moored close N of the reef.

Kaizenji Sho to Myojin Hana
6.175

1 The track then leads E, through the designated route, to the vicinity of Ohata Koro No 4 Light Buoy (safe water) (33°57′·56N 132°11′·78E), passing:

N of O Iso (33°57′·25N 132°10′·64E), a rock standing on a reef within a detached area of shoals; O Iso Light (white tower, 14 m in height) is exhibited from the rock. Thence:

2 S of Setoyama Hana (33°57′·71N 132°11′·07E), a wooded point backed by reddish cliffs, thence:

Under Oshima Bridge (33°57′·52N 132°11′·12E), a pale green bridge which spans the narrowest part of Obatake Seto; a fixed light is exhibited from its middle part, and lights (lateral) mark its central navigable span. Thence:

3 N of Myojin Hana (33°57′·29N 132°11′·28E), a wooded point; a white stone gateway, the entrance to a Shinto Temple, stands on the point.

Myojin Hana to Obatake Koro No 5 Light Buoy
6.176

1 The track continues a short distance E to the vicinity of Ohata Koro No 4 Light Buoy; it then leads NE, passing:

NW of a shoal area (33°57′·29N 132°12′·13E), with a depth of 10 m, which lies in the outer part of Migama Wan (6.187), thence:

NW of Naka Se (33°57′·81N 132°12′·19E), a rocky shoal area. Thence:

2 NW of Tanojiri Hana (33°57′·92N 132°12′·91E), a point densely covered with pine trees which forms the E entrance point to Migama Wan, thence:

Clear of Hara Su (33°59′·02N 132°13′·12E), a long and narrow shoal not marked by seaweed, thence:

NW of a flat-topped islet (33°59′·69N 132°14′·97E), 45 m in height, SW of Mae Shima (7.13).

Oshima Bridge from SW (6.175)
(Original dated 2009)
(Photograph - K_Hornet)

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